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ABSTRACT

During Summer 1986, the Division of Special Education of the New York City Board of Education operated a Chapter 1 Summer Program, Reading and Math with Athletics, which served a total of 1,625 students at 13 sites for six weeks. Students received morning instruction: one period per day each in reading, mathematics, and in athletic and recreational activities. The Big Apple Sports Program sponsored the athletic and recreational activities for a 4-week period. In addition, students had one cultural or recreational trip per week. Program personnel incorporated athletic activities into reading and math instruction, and used a holistic, meaning-centered approach to reading instruction. The sports curriculum component and the trips enhanced student motivation to learn reading and math. In reading, over 78 percent of the 1,314 participating students (who took both pretest and posttest) showed a gain of at least two points on the Reading Metropolitan Achievement Test (MAT); the mean gain was 5.3 points. In math, almost 79 percent of the 1,332 participating students showed a gain on the Math MAT of at least two points; the mean gain was 4.4 points. Program staff indicated that they wanted more audio-visual equipment and instructional materials. Recommendations for improving the program are offered. Data are presented on eight tables. (BJV)

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Evaluation Section Report
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September, 1987

E.C.I.A. Chapter 1
Reading and Math
with Athletics

Summer 1986

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SUMMARY OF THE REPORT

During summer 1986, the Division of Special Education (D.S.E.) of the New York City Board of Education operated a Chapter 1 Summer Program, Reading and Math with Athletics, which served a total of 1,625 students at 13 sites for six weeks. In this program, students received morning instruction: one period per day each in reading, mathematics, and in athletic and recreational activities. The Big Apple Sports Program sponsored the athletic and recreational activities for a four-week period. In addition, students had one cultural or recreational trip per week. Program personnel incorporated athletic activities into reading and math instruction. They used a holistic, meaning-centered approach to reading instruction and emphasized integrating students' personal experiences with language arts. In math, instruction emphasized word problems and practical skills. To measure academic progress, students took pretests and posttests with the Metropolitan Achievement Tests in Reading and Math.

The Office of Educational Assessment (O.E.A.) evaluated program implementation and student outcomes. To assess implementation, O.E.A. field consultants visited seven program sites to observe instruction, interview staff, and examine records. Results indicated that the program was satisfactorily implemented at all sites.

Program staff successfully incorporated sports themes into academic instruction; they indicated that the sports curriculum component and the trips enhanced student motivation to learn reading and math. Staff at several sites reported that the Big Apple Program was successful and recommended that it be extended for the full six weeks of the program. Staff at some sites indicated that they wanted more audio-visual equipment, math manipulative materials, and consumable instructional materials for students to take home.

At most sites program staff reported that test materials had arrived on time. Teachers liked the Special Education Teacher's Guide in Communication Arts but would have preferred the inclusion of complete math lessons and lessons for lower-functioning readers. They requested that teacher trainers provide more training in the holistic approach to reading and schedule periodic on-site meetings. They further requested that a duplicating machine and telephone be available at every site.

Classroom teachers selected the pretest level according to pre-program reading and math scores supplied for each student. These scores were not available, however, for all students.

The evaluation objectives for the program were that 75 percent of the students would show a gain of two raw score points from the pretest to the posttest in reading and math. The

objectives in both reading and mathematics were attained. In reading, over 78 percent of the 1,314 participating students (who took both pretest and posttest) showed a gain of at least two points on the Reading MAT. The mean pretest/posttest gain was 5.3 points (S.D.=6.6) across four test levels. In math, almost 79 percent of the 1,332 students for whom there were both pretest and posttest scores showed a gain on the Math MAT of at least two points. The mean gain was 4.4 (S.D.=5.1) across four test levels. Although the size of the gain varied by test area, all gains but one (geometry and measurement) were statistically significant. The results were comparable to those of the previous program cycle.

Calculation of the effect size provided an indicator of how educationally meaningful the gain might be considered. The effect size indicated that the gains in reading were moderately to highly meaningful while those in math were slightly to highly meaningful. Thus the program effectively promoted student mastery in reading and math.

The conclusions lead to the following recommendations:

- Ensure that the program begin in the most efficient manner possible by notifying parents of their children's acceptance into the program in a timely fashion, obtaining pre-program reading and math scores for all students, and guaranteeing that every site has a telephone and duplicating machine available.

- Assist program teachers by requesting that teacher trainers provide more training on the holistic approach to reading instruction and schedule periodic on-site meetings; expand the Special Education Teacher's Guide in Communication Arts to include lessons for lower functioning readers and complete math lessons.

- Provide more audio-visual materials and equipment, math manipulative materials, and high-interest, low-reading-level materials to sites requesting them, as well as more consumable instructional materials for students to take home.

- Maintain a sports program over the entire six weeks of the program.

ACKNOWLEDGEMENTS

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I. INTRODUCTION

This report presents the Office of Educational Assessment's (O.E.A.'s) evaluation of the 1986 E.C.I.A. Chapter 1 Summer Program, Reading and Math with Athletics. The Division of Special Education (D.S.E.) of the New York City Board of Education operated the program, which provided remedial reading and mathematics instruction to 1,625 eligible students with mild to moderate handicapping conditions. The Big Apple Sports Programs and other services provided supplementary athletic, recreational, and cultural activities. The program integrated these non-academic activities into the reading and math instruction.

The program, which operated five days a week from 8:30 A.M. to 12:30 P.M. for six weeks beginning July 7, 1986, was located at 13 sites in the five special education regions. Students received an average of one hour of reading instruction, one hour of math instruction, and participated in one hour of sports or other recreational activities daily. Breakfast and lunch took a half hour each. They took approximately one off-site trip every week.

Staff used student pretest scores on the Metropolitan Achievement Test (M.A.T.) in reading and math as a basis for the development of individualized instructional plans. To assess academic gains, they posttested students during the last week of the program with the same instrument.

The 1985 E.C.I.A. Chapter 1 Summer Program, Reading and Math with Athletics served approximately 1,900 students and used the

M.A.T. for pre- and posttesting. Over 75 percent of the students in both reading and math showed a pre test/posttest raw score gain. Recommendations for that program cycle included extending the sports program over the six weeks of the program, providing more audio-visual equipment and math manipulative, providing an adequate supply of test materials in a timely fashion, obtaining pre-program reading and math scores for all incoming students, and expanding the Teacher's Guide to better cover the needs of lower-functioning students and to include math lessons.

STAFF

The staff of the Chapter I Summer Program consisted of 148 classroom teachers who provided remedial reading and math instruction. The same number of paraprofessionals assisted them. Thirteen unit teacherscoordinated the activities of all classes and 13 site supervisors supervised the individual sites. The unit teachers were responsible for registration, testing, placement, transportation, and scheduling. The site supervisor took responsibility for coordination and supervision at each site. Five regional coordinators had responsibilities for program start-ups and overall coordination. In addition, there was at least one Big Apple Sports staff member at each site. Factors that influenced site selection included a central location for bus routes, the availability of adequate classroom and gymnasium space for a large number of classes, a breakfast and lunch program in place, and being open for other summer programs.

REPORT FORMAT

This report is organized as follows: Chapter II describes the evaluation methodology; Chapter III presents an analysis of the qualitative and quantitative findings of the evaluation by describing program activities, examining student outcomes, and identifying factors which facilitated or hindered program success; and Chapter IV presents conclusions and recommendations.

E.C.I.A. Chapter 1
Reading and Math
with Athletics

Summer 1986

OEA Evaluation Report

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II. EVALUATION METHODOLOGY

EVALUATION QUESTIONS

The evaluation assessed two major areas: program implementation and outcomes. Evaluation questions included the following:

Process/Implementation

- What was the level and quality of program implementation?
- Did teachers use a holistic approach to reading?
- Did program staff integrate the athletic and cultural activities with the reading and math instruction?

Outcome

- What was the program's impact on student achievement?

EVALUATION OBJECTIVES

O.E.A. addressed the following evaluation objectives. By August 15, 1986, 75 percent of participating students will have:

- shown a raw score gain from the pretest to the posttest of at least two points on the Reading M.A.T.;
- shown a raw score gain from the pretest to the posttest of at least two points on the Math M.A.T.

SAMPLE

Field consultants visited seven of the 13 program sites to observe instruction and sports activities, inspect records, and interview staff members. They observed seven reading classes, seven math classes, and seven athletic periods; they interviewed 14 classroom teachers (nine percent of the total), seven site

supervisors (54 percent of the total), and four unit teachers (31 percent of the total).

Teachers submitted achievement test data on all 1,625 Chapter 1- eligible students. Since gains could only be calculated for those students for whom there were pre- and posttest scores and because it was determined that only the scores of students who attended a minimum of 20 days should enter into the analysis, the sample for purposes of analyzing objective attainment consisted of 1,374 students for reading and 1,332 students for math.

INSTRUMENTS

O.E.A. developed two observation guides for field consultants. One enabled them to document the adequacy of physical facilities, records, instruction, and materials. They used the other guide to document the type of sports activities observed, along with the extent of student and staff participation. O.E.A. developed interview guides for their interviews of program personnel in order to obtain information on instructional activities, testing, materials, and staff training. Teachers used an O.E.A.-developed data retrieval form to contribute information about the target population and enter data on attendance as well as on pre- and posttest scores.

ANALYSIS

O.E.A. analyzed the achievement of program participants on a pretest/posttest basis. Test scores of only those students with

both pre- and posttest scores were included, permitting O.E.A. to examine the achievement data of fewer students than were in the program. Additionally, O.E.A. examined the achievement data only of those students attending a minimum of 20 sessions. Those students remaining in the sample undoubtedly accomplished more objectives than students in the program a shorter time or for fewer sessions. In both reading and mathematics, O.E.A. calculated the frequency distribution of raw score gains and computed the number and percent of students showing a raw score gain by test level. As a norm referenced test, the interval between the pre- and posttesting was too short to allow a valid comparison. Accordingly, assessment employed raw rather than standard scores. Additionally, O.E.A. computed statistical significance and effect size of mean raw score gains by test level for all pairs of matched scores.

Interviews of Chapter 1 teachers, special education classroom teachers, site supervisors, unit teachers, assistant coordinators, and regional supervisors provided additional data about the summer program. O.E.A. tabulated responses on the questionnaires and examined the comments made by program personnel. Observation schedules completed by O.E.A. staff furnished supplementary descriptive information on the implementation of the program.

III. EVALUATION FINDINGS

PROGRAM IMPLEMENTATION

D.S.E.'s Chapter 1 Summer Program provided reading and math remedial instruction and athletic and recreational activities to Chapter 1-eligible students with mild to moderate handicapping conditions. Almost fifty percent of the students attended at least 20 sessions out of possible 30 in summer 1986. The mean number of sessions attended was 19.1 (S.D.=6.6). Sixty-four percent of participating students had attended at least 20 sessions in the previous year.

Program Start-up and Student Enrollment

Five out of the seven site supervisors indicated that late notification of program funding (early June) resulted in difficulties in student enrollment. According to these supervisors, regional supervisor mailed letters to parents in mid or late June informing them of their child's acceptance. Some of these letters were not delivered because of an incorrect address, and others were returned after the end of the school year. At one site, the supervisor reported to O.E.A. that of 225 letters initially sent out, 25 percent were returned because of incorrect addresses. Data on this was not available from the previous cycle so it was impossible to make comparisons. To solve this problem, three of these site supervisors strongly recommended that funding notification be given early enough so that student acceptance and the necessary follow-up could be done while

students were still in school.

Orientation and Staff Development

Chapter 1 provided two days of on-site orientation for all classroom teachers. Most of the teachers who attended the orientation sessions reported that these were useful in familiarizing them with the objectives of the program in the areas of testing, instructional and recreational activities, and use of materials. Several recommended that they be given time during the orientation period to set up their classrooms. Site supervisors also found their own orientation to be helpful, but three of seven interviewed suggested that it be more participatory, possibly using a small-group format in order to discuss past problems and devise solutions for the current program.

With reference to staff development during the program's operation, seven of the 14 teachers interviewed and four of the seven site supervisors interviewed recommended more involvement of the teacher trainers on an ongoing basis. Two specific recommendations were that trainers offer more instruction on the holistic approach to reading (including demonstration lessons) and give guidance in working more effectively with paraprofessionals. Several staff members also recommended that one hour a week be devoted to staff development.

Implementation of Assessment Procedures

Staff at four of seven sites reported that they had received

sufficient information on functional reading and math levels or test scores for most of their students so they could select the correct pretest level. A number of teachers and site supervisors at all seven sample sites recommended that students for whom no pre-program functional reading and math level information was available be tested informally as soon as they began the program to determine which level M.A.T. they should administer as a program pretest. Program staff at six of the seven sites indicated that test materials had been delivered during the first week of the program, enabling pretesting to proceed on schedule.

Program teachers felt that the pretest Reading and Math M.A.T. were useful for instructional planning for high- and middle-level students, but less useful for lower-level students. To assess this group the teachers relied more heavily on their judgment and informal testing.

Instructional Methods and Materials

Reading. In documenting reading instruction, consultants noted that teachers used a holistic approach in a majority of the classes they observed, and that teachers incorporated sports and Statue of Liberty themes (to coincide with its centennial celebration) into most lessons. Teachers often included specific skills instruction with holistic teaching. In one class, for example, the teacher asked students to define words from a "Lady Liberty Glossary" that she had written on the blackboard, use the words in a sentence, and discuss their meaning in relation to the Statue of Liberty and immigration themes. The students read

aloud, then silently, a paragraph on the board containing the words. Students answered questions, in writing, which tested their comprehension and tapped specific skills such as finding the main idea, sequencing, and reading for detail. Finally, the teacher discussed with the students the paragraph they had read. In other classes, students discussed trips they had taken and then composed compositions, wrote in journals, or made experience charts describing the trips.

Both teachers and supervisors reported that they liked using the holistic approach to teach reading. They felt it was appropriate for their students, and particularly liked the emphasis on language development through listening, reading, writing, and speaking. In addition, teachers thought that the stress on meaning and the integration of personal experience, along with the incorporation of Statue of Liberty and sports themes, enhanced the effectiveness of the instruction. Teachers reported that the staff development activities contributed to their successful use of the holistic approach.

Consultants documented a variety of reading materials, including both commercial items and those that had been designed by teachers and students while teachers and site supervisors were generally satisfied with the reading materials provided, they did note some problems and offered solutions. The most frequently cited difficulty was a lack of materials on the lower reading level as had been reported in the previous program cycle. To remedy this situation, three staff members recommended that

the program order an abundance of materials for every level and arrange with the publishers to return unused items. Other teacher recommendations were to order more audio-visual materials, especially tape read-alongs, more story books, and more of the craft supplies (e.g. construction paper, crayons, and scissors) that the Teacher's Guide in Communication Arts recommended for use.

Math. In math instruction, field consultants observed that teachers emphasized the use of word problems, whole number operations, practical skills, and concrete manipulative materials. In addition, they incorporated sports, Liberty themes, and field trips into the lessons. In one class, for example, the teacher taught the concept of "rounding off" by asking students to approximate and add in their heads the prices of tickets to a baseball game. Several teachers asked students to calculate the dimensions of athletic fields, keep score, trace baseball team standings, or compare times in races they ran. Teachers also reported they used the Statue of Liberty theme to teach measurement. Some students added the prices of the items they bought on a recent field trip to the zoo. Teachers used concrete-manipulative materials for lessons in numeration, addition. and subtraction. O.E.A. consultants found a correspondence between the math instruction they observed and the instructional strategies teachers reported that they used.

Consultants observed that teachers used both commercial and teacher- designed math materials. Program staff reported that

there was an adequate supply of most materials, except for concrete-manipulative items. Several teachers recommended that the program order more of these materials.

Curriculum Guide. O.E.A. examined the Teacher's Guide in Communication Arts and teachers reported on its usefulness. The Special Education Curriculum Unit developed the Teacher's Guide for use during the Chapter 1 summer program. It is not used during the academic year. O.E.A. assessed the guide's clarity, comprehensiveness, and appropriateness to the goals of the program. With regard to clarity, the guide contained demonstration lessons which were well-organized and clearly presented. The guide gave specific directions for reinforcement and follow-up activities; the overall format was easy to follow. The guide was comprehensive in that it covered all the reading objectives described in the Minimum Teaching Essentials. The instructional objectives were considered appropriate for high- and middle-level readers, but judged to be too difficult for low-functioning readers. Finally, the guide was considered appropriate to the program goals for reading because lessons were constructed holistically -- each lesson included extensive activities in reading, writing, listening, and speaking, and suggested methods of utilizing students' personal experiences. Every lesson was constructed around a Statue of Liberty or sports theme.

Ten out of 14 teachers interviewed (71 percent), indicated that the guide was at least moderately useful to them; they found

the lessons clear, well-organized, interesting, and appropriate with good use of thematic material. This compares with 11 out of 13 teachers interviewed (85 percent), last year. Eight teachers (57 percent) indicated that the lessons were better suited to high-level readers; seven teachers (50 percent) recommended that new guides include complete math lessons. Teachers made these recommendations in the last program cycle.

Non-Instructional Activities

Sports Activities and Trips. Field consultants noted that the sports activities they observed were well-organized and included a variety of activities (e.g. basketball, swimming, calisthenics, dodgeball). Staff supervision, instruction, and student participation were judged to be satisfactory at all sites visited; most children appeared active and seemed to be enjoying the experiences.

All staff members reported that the sports activities and trips were an essential part of the program. They said that students not only enjoyed these activities, but that their participation in them was motivating, bolstered their attendance and increased student achievement. In addition, a number of teachers and site supervisors expressed the opinion that the quality of athletic instruction provided was quite high. Most respondents recommended that, if possible, the Big Apple Program continue over the entire six weeks rather than just four weeks of the program. The other recommendation, offered at three sites, was that there be more communication between the Big Apple and

school staff so that teachers would be more aware of what sports activities were planned and the Big Apple staff could be more fully apprised of students' needs.

Technical Support Services. O.E.A. evaluated three aspects of technical support services important to the program's implementation: transportation, duplication services, and telephones.

Site supervisors and program teachers at five of the seven sample sites reported that transportation services were good. At the other two sites, supervisors indicated that during the first week of the program some buses delivered students late, apparently because bus drivers were not completely familiar with their routes. To remedy this problem, the supervisors recommended that drivers become familiar with their bus routes prior to the start of the program.

At three sites, both supervisors and program teachers said that not having a working duplicating or rexograph machine available on-site was a serious problem. At one of these sites, no telephones were available until after the program began.

Recordkeeping. After reviewing student records at each site they visited, O.E.A. consultants concluded that records were comprehensive, well-organized, and up-to-date.

STUDENT OUTCOMES

Reading Achievement

Each student received one of four levels of the M.A.T. reading test: Primary 1, Primary 2, Elementary, or Intermediate.

The functional reading level or earlier test score determined the selection of the test level. The evaluation objective in reading was attained in that 78.5 percent of the students across all test levels demonstrated a raw score gain of at least two points from the pretest to the posttest. (See Table 1.) Groups tested at all test levels met the 75 percent achievement criterion of the evaluation objective. (See Table 2.) The group taking the Elementary level had the largest proportion of students demonstrating a gain. The mean raw score gains at all four test levels were statistically significant ($p < .01$). (See Table 3.) The mean gain ranged from a low of 5.1 (Primary 1 and Intermediate) to a high of 5.6 (Elementary). The mean gain across all test levels was 5.3 (S.D. = 6.6). Effect size,* an index of the educational meaningfulness of a gain, indicated that all gains were substantial, with the gain at the Elementary level being the most meaningful.

Mathematics Achievement

As in reading, each student received one of four levels of the M.A.T. Math test: Primary 1, Primary 2, Elementary, or Intermediate. Each student received only one specific math subtest: whole number operations, problem-solving, geometry and

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*The effect size, developed by Jacob Cohen, is a ratio of the mean gain to the standard deviation of the gain. This ratio provides an index of improvement in standard deviation units irrespective of the size of the sample. Effect size (E.S.) is interpreted to indicate educational meaningfulness, and an E.S. of .8 is thought to be highly meaningful, while one of .2 is considered to be only slightly so.

TABLE 1

Frequency Distribution of Raw Score Gains in Reading[a]

Raw Score Number of Gain	Students	Cumulative Percent Percent
Over 30 9	0.7	0.7
21-30 37	2.8	3.5
11-20 148	11.3	14.8
5-10 271	20.6	35.4
3-5 415	31.6	67.0
2 151	11.5	78.5
1 124	9.4	87.9
0 50	3.8	91.7
(loss) 109	8.3	100.0
TOTAL 1,314	100.0	

Source: M.A.T. reading pre- and posttest results.

[a] The difference between pretest and posttest scores on all tests levels combined.

- Over 78 percent of the participating students showed a raw score gain of at least two points from the pretest to the posttest.
- Almost 88 percent of participating students showed a raw score gain of at least one point.

TABLE 2

Number and Percent of Students
Showing a Raw Score Gain of at Least Two Points
in Reading, by Test Level

Level	Studentsa	Students Showing a Gain of at Least Two Points	
		Number	Percent
Primary 1	331	247	74.6
Primary 2	313	246	78.6
Elementary	281	233	82.9
Intermediate	239	182	76.2
All levels	1,164	908	78.0

Source: M.A.T. reading pre- and posttest results.

[a] Students on whom there are pretest, posttest, and test level data.

- Students tested at all test levels met the program objective that 75 percent would achieve a raw score gain of at least two points from the pretest to the posttest.
- Students tested at the Elementary level had the largest percentage showing raw score gains.

TABLE 3

Statistical Significance and
Effect Size of Mean Raw Score
Gains in Reading, by
Test Level

Level	Number of Students	Mean Raw Score Gain	Standard Deviation	t-value	Effect Size
Primary 1	(357)	5.1	6.3	15.2*	.81
Primary 2	(322)	5.4	7.2	13.4*	.75
Elementary	(295)	5.6	6.1	15.8*	.92
Intermediate	(300)	5.1	6.6	13.2*	.77

*Difference is statistically significant, $p < .01$.

Source: Reading M.A.T. pre and posttest results.

- Mean raw scores on all test levels were significantly higher after the instructional program.
- The mean raw score gain and its educational effect size was greatest for students tested at the Elementary level.
- Raw score gains on the Primary 1 and Elementary levels were highly meaningful.

measurement, or numeration, whatever area the teacher proposed to cover during the summer session.

The evaluation objective in math was attained in that 78.8 percent of the students showed a raw score gain of at least two points from the pretest to the posttest. Most students gained from three to ten points. (See Table 4.) Students at all four test levels reached the achievement criterion, with the group taking the Elementary and Intermediate levels having the highest percent of students showing a gain. (See Table 5.) Students met the program's objective irrespective of the subtest which they received. (See Table 6.)

The mean raw score gains at all four test levels and on three of the four math subtests were significant ($p < .01$); the raw score gain on the geometry and measurement subtest was not. (See Tables 7 and 8.) The mean gain across test levels varied from a low of 4.1 (Intermediate) to a high of 5.0 (Elementary), with an overall mean of 4.4 (S.D. = 5.1). (See Table 7.) Gains demonstrated by those students taking the Primary 2 level were the most educationally meaningful. The mean gain across subtests ranged from a low of 3.1 (geometry and measurement) to a high of 4.7 (problem solving) with a mean of 4.4 (S.D. = 5.1). (See Table 8). Gains demonstrated by those students taking the problem solving subtest were the most educationally meaningful.

Overall, the student achievement objectives were met, even though the period between test administrations was brief. Average gains, although fairly small, were statistically

TABLE 4

Frequency Distribution of
Raw Score Gains in Mathematics

Raw Score Gain	Number of Students	Percent	Cumulative Percent
21-30	13	1.0	1.0
11-20	110	8.3	9.3
5-10	293	22.0	31.3
3-5	451	33.8	65.1
2	183	13.7	78.8
1	123	9.2	88.0
0	77	5.8	93.8
(Loss)	82	6.2	100.0
TOTAL	1,332	100.0	

Source: Math M.A.T. pre- and posttest results.

- Almost 79 percent of the participating students had raw score gains of at least two points from the pretest to the posttest.
- More than half of the students gained from three to ten raw score points.

TABLE 5

Number and Percent of Students
Showing a Raw Score Gain of at Least Two Points
in Math, by Test Level

Level	Students[a]	Students Showing a Gain of at Least Two Points	
		Number	Percent
Primary 1	215	163	75.8
Primary 2	261	202	77.4
Elementary	360	289	80.3
Intermediate	322	259	80.4
All levels	1,158	913	78.8

Source: Math M.A.T. pre- and posttest results.

[a] Students on whom there are pretest, and test level data.

* Students tested at all four test levels reached the program objective that 75 percent would achieve a raw score gain of at least two points from the pretest to the posttest.

TABLE 6

Number and Percent of Students
Showing a Raw Score Gain of at Least Two Points
in Math, by Subtest
(N = 1,140)

Subtest	Students	Students Showing a Gain of at Least Two Points	
		Number	Percent
Whole Number Operations	560	429	76.6
Problem Solving	395	327	82.8
Geometry and Measurement	10	8	80.0
Numeration	175	136	77.7

Source: Math M.A.T. pre- and posttest results.

- Students tested in problem solving had the largest percentage of students showing a raw score gain.
- Students met the program objective irrespective of which subtest they took.

TABLE 7

Statistical Significance and Effect Size
of Mean Raw Score Gains in
Math, by Test Level
(N - 1,158)

Level	Number of Students	Mean Raw Score Gain	Standard Deviation	t-value	Effect Size
Primary 1	215	4.5	6.8	9.8*	.66
Primary 2	261	4.3	4.6	15.2*	.93
Elementary	360	5.0	4.7	20.7*	1.06
Intermediate	322	4.1	4.5	16.7*	.91

*Difference is statistically significant, $p < .01$.

Source: Math M.A.T. pre- and posttest results.

- Mean raw scores on all test levels were significantly higher after the instructional program.
- The mean raw score gain was greatest for students tested at the Elementary level.
- The gain was most educationally meaningful (showed the largest effect size) for the Elementary group.
- Raw score gains on the Primary 2, Elementary, and Intermediate levels had large associated effect sizes.

TABLE 8

Statistical Significance and Effect Size
of Mean Raw Score Gains in Math,
by Subtest
(N = 1,140)

Level	Number Students	Mean Raw Score Gain	Standard Deviation	t-value	Effect Size
Whole Number Operations	560	4.3	4.8	22.9*	.90
Problem Solving	395	4.7	4.2	24.6*	1.12
Geometry and Measurement	10	3.1	10.0	1.2	.31
Numeration	175	4.3	7.2	8.3*	.86

*Difference is statistically significant, $p < .01$.

Source: Reading M.A.T. pre- and posttest results.

- Mean raw score gains in all subtests except geometry and measurement were significantly higher after the instructional program.
- The mean raw score gain was greatest for students taking the problem-solving subtest.
- The gain was most educationally meaningful (showed the largest effect size) for the problem-solving subtest.

significant and educationally meaningful with the exception of the geometry and measurement subtest in mathematics.

IV. CONCLUSIONS AND RECOMMENDATIONS

The 1986 Summer Chapter 1 Program provided reading and math instruction to students at 13 sites from July 7th through August 15th, 1986. Students received daily instruction in reading and mathematics and engaged in an athletic or recreational activity. The Metropolitan Achievement Test in reading and math provided pre-and post test data.

The program achievement objectives were attained: over 75 percent of students tested in reading and math demonstrated M.A.T. pre- to posttest raw score gains. In reading, over 78 percent of the 1,314 participating students for whom there were pre- and posttest scores showed a gain of at least two points. This was comparable to summer 1985, when 71 percent showed a pre- to posttest gain of at least two points. In math, almost 79 percent of the 1,332 students for whom there were pretest/posttest data showed a gain of at least two points. This is a higher proportion than the results of the previous program cycle when over 72 percent of the participating students showed raw score gains of at least two points. Students examined at each of four levels showed statistically significant pre- to posttest mean gains ($p<.01$); the effect size for all students in reading (.80) and math (.86) suggested that those gains were highly meaningful.

Analysis of math achievement by subtest skill area revealed that students tested in the four subtest areas (whole number operations, problem-solving, geometry/measurement, and

numeration) attained the program objective that at least 75 percent would demonstrate a pretest/posttest gain of at least two points. All except geometry and measurement were statistically significant ($p < .01$.). Particularly noteworthy were the results for students instructed in problem solving. Students tested on all levels of the math M.A.T. attained the program objective.

Interviews with program staff and observations of classes and athletic activities indicated that program services met student needs and that materials, with a few exceptions, satisfied the instructional needs of participating students. Although the Chapter 1 Summer Program was satisfactorily implemented, personnel interviewed suggested areas in which it might be improved.

To ensure proper planning for the program, site supervisors recommended that parental notification occur much earlier in future programs. In this manner, parental acceptance would be earlier, allowing for the inclusion of functional reading and math levels in papers given to teachers before the start of the program. An improvement relative to the Summer 1985 program was noted in that the pretests were delivered in a timely fashion. Program teachers, claimed that they would have appreciated receiving more pre-program training in using the holistic approach as well as additional on site training during the course of the program. Concerning materials both for teacher and student use, the teachers liked the curriculum guide, Special

Education Teacher's Guide in Communication Arts, and several recommended its expansion. Some teachers indicated that they wanted more equipment and materials to better meet the needs of their students. Teachers also felt, as they did in previous years, that students would benefit greatly if the Big Apple sports activities were to be offered during the entire six weeks of the program.

The Chapter 1 Summer program was highly successful, taken in its implementation and in its outcomes. The combined effects of staff development activities, using the holistic approach in reading, integrating athletic activities, and providing out of class trips are the arraignment of program success. The conclusions lead to the following recommendations:

- Ensure that the program begin in the most efficient manner possible by notifying parents of their children's acceptance into the program in a timely fashion, obtaining pre-program reading and math scores for all students.
- Assist program teachers by requesting that teacher trainers provide more training on the holistic approach to reading instruction and schedule periodic on-site meetings; expand the Special Education Teacher's Guide in Communication Arts to include lessons for lower functioning readers and complete math lessons.
- Provide more audio-visual materials and equipment, math manipulative materials, and high-interest low reading level materials to sites requesting them, as well as more consumable instructional materials for students to take home.
- Maintain sports activities over the entire six weeks of the program.